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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/645,493	08/22/2003	Maria Ronay	YOR920030195US1	8744

30678 7590 02/02/2006

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ART UNIT	**PAPER NUMBER**
3723	

DATE MAILED: 02/02/2006

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/645,493
Filing Date: August 22, 2003
Appellant(s): RONAY, MARIA

Burton A. Amernick
Attorney
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 11/7/2005 appealing from the Office action mailed 5/4/2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,958,794	Bruxvoort et al.	12-2004

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

1. Claims 17-19, 21-23, 28, 33 and 36 rejected under 35 U.S.C. 102(b) as being anticipated by Molnar (6,283,829).

2. In reference to claim 17, Molnar discloses a method of finishing semiconductor wafers comprising providing a liquid polishing slurry comprising abrasive particles to the surface to be planarized (col. 28, line 67 – col. 29, line 1) and contacting said surface with a polishing pad that consists essentially of a polymeric matrix (matrix is defined as: A situation or surrounding substance within which something else originates, develops, or is contained[1] and the polymer making up the polishing pad [col. 15, line 64] contains the solid lubricant particles, thus making it a matrix) and solid lubricant particles (col. 29, lines 12-23) in an amount sufficient to reduce friction between the pad and surface during planarizing (lubricant is defined as an agent that reduces friction between moving surfaces in col. 5, lines 15-16). Molnar discloses several embodiments of the CMP process and teaches that it is advantageous to provide lubricant and abrasive particles separately to improve finishing control (col. 29, lines 8-11). Molnar discloses that a preferred type of lubricant is one that can be included in the finishing element (polishing pad) such as a solid lubricant (col. 29, lines 12-23). In view of the disclosure, it is inherent that the abrasive would be provided in a polishing slurry when the solid lubricant is included in the polishing pad because it is preferred to supply the lubricant and abrasive separately.

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3. In reference to claim 18, Molnar discloses the method discussed supra and further discloses that a preferred lubricating agent may be a fluorocarbon resin selected form a group comprising PTFE, PFA, or FEP (col. 29, lines 48-66).

4. In reference to claim 19, Molnar discloses that the solid lubricant may be PTFE, but does not disclose a range for the coefficient of friction for the material. Extrinsic evidence is provided at web address www.plastomertech.com/properties.asp that the coefficient of friction of PTFE is 0.04, thus within the range claimed in claim 19.

5. In reference to claims 21 and 22, Molnar discloses the method, as discussed supra, and that the solid lubricant may be PTFE, but fails to disclose that the size solid lubricant particles is about 0.05 to about 18 microns or further that the size solid lubricant particles is about 0.05 to about 0.5 microns but extrinsic evidence is provided by Yamada (6,312,759) that the mean particle size of Polytetrafluoroethylene (PTFE) is 0.5 μm (microns) (col. 29, lines 19-20).

6. In reference to claim 23, Molnar discloses that ultra high molecular weight polyethylene (UHMWPE) is a preferred ingredient (col. 25, lines 39-43) but does not disclose the actual molecular weight of such materials. Extrinsic evidence is provided in U.S. Patent number 5,411,351 (Lasch) that UHMWPE has a molecular weight of at least 500,000 (col. 4, lines 31-33), thus within the range claimed in claim 23.

7. In reference to claim 28, Molnar discloses the method discussed supra and further discloses that the polymeric matrix is preferably made from an organic synthetic polymeric material selected from a group comprising polyurethanes, polyesters, polyamides and polyvinylchloride (col. 16, lines 5-11).

8. In reference to claim 33, Molnar discloses the method discussed supra and further discloses that the surface to be polished may be a wafer comprising copper aluminum and tungsten (col. 22, lines 17-20) or a low dielectric polymer (col. 22, line 54).

9. In reference to claim 36, Molnar discloses the method discussed supra and further discloses that the planarizing may be chemical mechanical polishing (CMP) (col. 1, line 12).

10. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Molnar (6,283,829) in view of Nishida (5,714,700).

11. Molnar discloses the method discussed supra but fails to disclose that the solid lubricant particles have a spherical, cylindrical or platelet shape. Nishida discloses a self-lubricating material wherein the solid lubricant particles are spherical or of platelet form, thus, teaching that solid lubricant particles may be spherical or of platelet form. Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that the solid lubricant particles of Molnar may be spherical, cylindrical or platelet shaped because these shapes are commonly known in the art as shapes for solid lubricant particles, as taught by Nishida.

12. Claims 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Molnar (6,283,829) in view of Horie (4,555,250).

13. Molnar discloses the method discussed supra and teaches that one preferred work piece may be a glass television faceplate but fails to disclose that the amount of solid lubricant is about 0.5 to 30% by weight, or further disclose that the amount of solid

lubricant is about 0.5 to 10% by weight, or even further disclose that the amount of solid lubricant is about 2 to 3% by weight. Horie discloses a grinding apparatus (grinding is essentially the same as polishing, polishing is on a finer level than grinding, both use abrasives to remove surface layers) for precision grinding of glass objects that uses a solid lubricant that is disposed within the grinding pad (lubricant is provided as a powder prior to sintering [col. 3, lines 56-58] so inherently becomes a part of the grinding pad after sintering) in a preferred amount between 1 and 5% by weight (claim 8). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the solid lubricant to the invention of Molnar in the amount of 1 to 5% by weight as a preferred amount to provide precision grinding/polishing to the work piece, as taught by Horie. This range of lubricant to be provided further limits the claimed ranges in claims 24 and 25 and overlaps the range claimed in claim 26, therefore making the range disclosed by Horie a relevant prior art rejection (see MPEP 2131.03 [R-2]).

14. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Molnar (6,283,829) in view of Murata (6,194,357).

15. Molnar discloses the method discussed supra but fails to disclose that the solid lubricant particles are treated with a surfactant in an amount sufficient to disperse the lubricant in a planarizing slurry upon being detached from the pad during planarization. Murata teaches that surfactant may be used in waterborne lubricant (CMP slurry is commonly known to comprise water to one of ordinary skill in the art) in order to disperse a solid lubricant in the water to homogeneity (col. 6, lines 33-38). Therefore it

would be obvious to one of ordinary skill in the art at the time the invention was made to treat the solid lubricant disclosed by Molnar with a surfactant in order to produce a homogeneous slurry when the solid lubricant particles become detached from the pad during planarization. A homogeneous slurry would be advantageous because it would provide uniform lubrication and polishing across the entire surface of the substrate and prevent scratching due to built up particles.

16. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Molnar (6,283,829) in view of Bajaj (6,045,435).

17. Molnar discloses the method discussed supra but fails to disclose that the polymeric matrix that makes up the polishing pad is micro porous. Bajaj discloses a CMP process and teaches that it is common to use polishing pads in the CMP process and that polyurethane pads typically comprise micro-porous urethane (col. 8, lines 8-13). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to use a polishing pad comprising a micro-porous urethane (such as polyurethane disclosed by Molnar) because it was commonly known in the art to use micro-porous polishing pads in the CMP process, as taught by Bajaj.

18. Claims 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Molnar (6,283,829) in view of Cook (5,489,233).

19. In reference to claim 30, Molnar discloses the method discussed supra but fails to disclose that the polymeric matrix that makes up the polishing pad is non-porous. Cook discloses a polishing pad comprising a solid uniform polymer sheet having no intrinsic ability to absorb slurry particles (abstract, lines 1-4) and teaches that prior art

pads with composite structure (pores) are quite complicated to manufacture relative to manufacture processes for solid homogeneous material (col. 3, lines 7-11). One definition of the word "solid" is: Having no gaps or breaks; continuous:[2], thus defining the polishing pad of Cook as non-porous. Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to make the polymeric matrix non-porous minimize the difficulty of producing a porous polishing pad.

20. In reference to claim 31, Molnar discloses the method discussed supra but fails to disclose that the polishing pad surface contains macroscopic channels before use and microscopic texture during use to facilitate slurry transportation. Cook discloses a polishing pad that has macrotextures which act as channels for the unimpeded flow of slurry (col. 4, lines 39-42) and microtextures that also act as channels for the unimpeded flow of slurry (col. 5, lines 24-27), thus the polishing pad would have both macroscopic and microscopic channels before and during use. Cook further teaches that the unique combination of macroscopic and microscopic flow channels, present simultaneously, allows complete, unimpeded and uniform slurry flow to every portion of the pad surface (col. 5, lines 31-34). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to form macroscopic and microscopic flow channels in the surface of the polishing pad to allow complete, unimpeded and uniform slurry flow to every portion of the pad surface making the polishing more

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efficient at producing a uniform polished surface across the entire surface of the substrate.

21. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Molnar (6,283,829) in view of Chiddick (6,136,757).

22. Molnar discloses the method discussed supra but fails to disclose that the lubricant particles comprise a binding agent, coupling agent or adhesive promoter. Chiddick provides a solid lubricant and teaches that the addition of a binding agent is capable of binding a solid lubricants to metallic surfaces (such as the substrate) by dispersing the solid lubricant or holding the solid lubricant in a discontinuous phase matrix and that the binding agent has rigidity such that when the composition is placed on the metal surface, it has some structure and will maintain its integrity (col. 4, lines 54-64) after being exposed to forces from other objects (such as polishing pad). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to provide the solid lubricant with a binding agent to assist with dispersing the lubricant across the surface of the substrate to provide a uniform polished surface and to maintain the integrity of the lubricant during use to prevent the breakdown of the lubricant particles, thus extending the life of the lubricant composition and minimizing the amount of lubricant needed and overall operating cost of the polishing apparatus.

23. Claims 34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Molnar (6,283,829) in view of Molnar (6,390,890).

24. In reference to claim 34, Molnar ('829) discloses the method discussed supra but fails to disclose that a surface to be polished contains a low-k porous dielectric, low-k

non-porous dielectric, air bridges or a combination of any of these materials. Molnar ('890) discloses a CMP process comprising abrasive and solid lubricant particles for finishing semiconductor wafers (disclosed as preferred work pieces by Molnar '829) having low-k dielectric layer and that one example of these low-k dielectric materials is low-k porous dielectric material. Therefore, it is well known in the art that CMP processes may be used to polish low-k dielectric materials such as low-k porous dielectric material so it would have been obvious to one of ordinary skill in the art at the time the invention was made that the polishing pad of Molnar ('829) would be inherently capable of polishing a low-k porous dielectric wafer and would even be a preferred polishing pad due to the inclusion of a solid lubricant, as taught by Molnar ('890).

25. In reference to claim 35, Molnar ('890) further discloses that organic polymers and doped oxides are other examples of low-k dielectric materials so it would further be obvious that the polishing pad of Molnar ('829) would be preferred to polish an organic polymer or doped oxides, as discussed supra. Although Molnar does not disclose that the doped oxides are CVD or that the organic polymers are of the spin on type, this portion of claim 35 appears to be product by process claims. Therefore, the doped oxides and organic polymers, as disclosed by Molnar ('890) in used with the Molnar ('829) disclosure provide relevant prior art for a rejection because doped oxides and organic polymers would react in the same way no matter what process was used to produce them.

(10) Response to Argument

A. Molnar does anticipate claims 17-19, 21-23, 28, 33 and 36.

26. The applicant makes several argument against the Molnar reference properly anticipating the claimed invention.

27. The first argument made by the applicant (page 6 of appeal brief, lines 4-13) is that Molnar does not disclose a polishing pad that "consists essentially" of the polymeric matrix and solid lubricant particles. However, the Molnar reference does specifically disclose a polishing pad that "consists essentially" of polymeric matrix and solid lubricant particles in column 29, lines 36-38. The disclosure provides a lubricant that is contained in a finishing element body wherein the body is composed of organic synthetic polymer. Thus the pad is polymeric and based on the previously cited definition of the word "matrix" the polymeric body is a matrix because it has lubricant particles disposed within it. This disclosed pad is immediately preceded by multiple paragraphs discussing that solid lubricant particles are preferred so it is clear that the lubricant particles disclosed in this passage are solid lubricant particles. Therefore, Molnar specifically discloses a polishing pad that "consists essentially" of a polymeric matrix and solid lubricant particles.

28. The second argument made by the applicant (page 6 of appeal brief, lines 14 thru the end of page 6) is that Molnar does not teach that the abrasive should be supplied in the slurry in the case that the lubricant is supplied in the polishing pad because the disclosure that the lubricant and abrasive should be supplied independently of one another to improve finishing control (col. 29, lines 8-11) only refers to a situation where the lubricant and adhesive are both supplied in separate finishing

compositions (slurries) and the applicant sites the paragraph that begins in col. 28, line 62 and ends in col. 29, line 11. However, even within this passage, Molnar discloses that the lubricant should be provided in a finishing composition in the case that the abrasive is in the finishing element (polishing pad) in col. 29, lines 3-8, in order to separately and independently control the lubricant and abrasive. Immediately following the cited passage, Molnar discloses several situations wherein the solid lubricant is provided in the polishing pad (col. 29, lines 12-47) including the specific example, discussed supra, regarding the first argument. Therefore, it clearly would be inherent, in view of the cited passage, that providing the abrasive in a slurry when the lubricant is provided in the polishing pad will be the only way to separately and independently control the lubricant and abrasive.

29. The third argument made by the applicant (page 7 of appeal brief, lines 1 and 2) is that Molnar suggests using either a solid or liquid lubricant and that arriving at the claimed invention would necessitate a "fortuitous selection among a myriad f possibilities". However, as discussed supra, Molnar provides specific examples of a polishing pad consisting essentially of a polymeric matrix and solid lubricant particles.

30. The fourth argument made by the applicant (page 7 of appeal brief, lines 3-7) is that Molnar is concerned with a friction detector and a method for finishing semiconductor wafers and not to new innovative polishing pads. However, it is irrelevant what the Molnar patent is specifically intending to claim as a new invention because it does disclose the polishing pads and method of the applicant's claimed invention and as the applicant argues, the polishing pads and processes disclosed by

Molnar are already known polishing pads and techniques. Therefore, if anything, Molnar not only anticipates the applicant's claimed invention but also discloses that it is old and well known in the art.

31. The fifth, (and final) argument made by the applicant against the Molnar reference properly anticipating the claimed invention (page 7 of appeal brief, lines 23 to page 8, line 6) is that Molnar provides a broad group of possibilities and that the selection of a specific combination avoids a lack of novelty rejection. However, as discussed supra, Molnar discloses several specific examples and teachings relevant to those specific examples that specifically anticipate the applicant's claimed invention.

B. Molnar in view of Nishida does render obvious claim 20.

32. Applicant argues that Nishida does not overcome the deficiencies of Molnar but, as discussed supra, Molnar does not have deficiencies to the claimed invention so Molnar and Nishida provide a proper showing of obviousness to reject claim 20.

C. Molnar in view of Horie does render obvious claims 24-26.

33. Applicant argues that Horie does not overcome the deficiencies of Molnar but, as discussed supra, Molnar does not have deficiencies to the claimed invention. Further, the applicant argues that Horie is not properly combinable with Molnar because Horie relates to glass grinding sheets from powdery metal compositions and not from polymer compositions. However, both references relate to abrading glass using abrasive materials and solid lubricant particles so it would clearly be obvious that providing a

similar range of lubricant in both situations would provide sufficient lubrication. If anything the powdery metal compositions of Horie would be more abrasive and would require more lubricant than Molnar, thus, the range of lubricant provided by Horie will provide sufficient lubrication for Molnar.

D. Molnar in view of Murata does render obvious claim 27.

34. Applicant argues that Murata does not overcome the deficiencies of Molnar but, as discussed supra, Molnar does not have deficiencies to the claimed invention so Molnar and Murata provide a proper showing of obviousness to reject claim 27.

E. Molnar in view of Chiddick does render obvious claim 32.

35. Applicant argues that Chiddick does not overcome the deficiencies of Molnar but, as discussed supra, Molnar does not have deficiencies to the claimed invention. Further, the applicant argues that Chiddick is not combinable because Chiddick does not relate to polymeric compositions. However, Chiddick is combinable because, although the use of Chiddick is in an unrelated art, Chiddick discloses the general advantages of using a binding aid with solid lubricant particles on metal surfaces and because many of the surfaces to be polished by Molnar (refer to claim 33) are metal, it would have been obvious that the addition of a binding aid would provide the solid lubricant particles of Molnar with the same advantages, which would also be desired in the Molnar reference, as the binding aid provides in the Chiddick reference.

F. Molnar ('829) in view of Molnar ('890) does render obvious claims 34 and 35.

36. Applicant argues that Molnar ('890) does not overcome the deficiencies of Molnar ('829) but, as discussed supra, Molnar ('829) does not have deficiencies to the claimed invention. Further, the applicant argues that Molnar ('890) teaches away from the present invention since Molnar ('890) relates to finishing elements with fixed abrasives. However, the Molnar ('890) disclosure teaches that it is old and well known to use CMP processes with abrasives on low-k porous dielectric wafers and that polymers and doped oxides are low-k dielectrics and further teaches that it is preferred to polish low-k porous dielectric wafers with lubricant aids. Therefore it would have been obvious that it would be desired to use the Molnar ('829) method to polish the low-k porous dielectric wafers.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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1/20/06

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